

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-49 (Canceled)

Claim 50 (Currently Amended) A catheter device for placement in a fluid containing portion of the body of a mammalian patient to effect in situ heat exchange, said catheter device comprising:

an elongate flexible catheter having a proximal end and a distal end, the entire length of said flexible catheter being defined as the distance from its proximal end to its distal end;

said flexible catheter having a distal insertion portion, which is insertable into the patient;

a heat exchanger located at a first location on the distal insertion portion of the catheter, said heat exchanger comprising a generally helical balloon or a balloon having at least one generally helical lobe through which heat exchange fluid may circulate ~~having heat exchange fins extending from the surface of said heat exchanger, said heat exchange fins comprising increased surface area for enhanced heat exchange, said heat exchanger being operative to exchange heat between body fluid in heat exchange proximity to said heat exchanger and heat exchange fluid circulating through said heat exchanger~~, said first location extending less than the entire length of the catheter;

~~at least one fluid lumen in through which said thermal exchange fluid may be circulated~~ useable for circulation of heat exchange fluid through said heat exchanger; and

a working lumen, said working lumen extending through said at least part of said insertion portion.

Claim 51 (Original) The catheter device of Claim 50 wherein the heat exchanger comprises:

at least one balloon through which said thermal exchange fluid is circulated, and said heat exchange fins comprise a plurality of lobes.

Claim 52 (Original) The catheter device of Claim 50 wherein said at least one heat exchange fin comprises at least one outwardly extending longitudinal fin.

Claim 53 (Original) The catheter device of Claim 50 wherein said at least one heat exchange fin comprises at least one outwardly extending annular fin.

Claim 54 (Original) The catheter device of Claim 50 wherein said at least one heat exchange fin comprises at least one outwardly extending helical fin.

Claim 55 (Original) The catheter device of Claim 50 wherein said at least one heat exchange fin comprises a plurality of outwardly extending individual protuberances.

Claim 56 (Original) A system comprising the catheter device of Claim 50 further in combination with:

a guide wire sized to be passable through said working lumen.

Claim 57 (Original) A system comprising the catheter device of Claim 50 further in combination with:

an apparatus for infusion of a medicament through said working lumen.

Claim 58 (Original) The system of Claim 57 wherein said apparatus for infusion contains a medicament selected from the group of medicaments consisting of:

a thrombolytic agent;
an anticoagulant;
a neuro-protectant;
a barbiturate;
an anti-seizure agent;
an oxygenated perfusate;
a vaso-dilator;
an agent which prevents vaso-spasm;
an agent to prevent platelet activation; and,
an agent to deter the adhesion of platelets.

Claim 59 (Original) A system comprising the catheter device of Claim 57 further in combination with:

an apparatus for infusion of a radiographic contrast agent through said working lumen; and,

an imaging apparatus for imaging the radiographic contrast agent which has been infused through said working lumen.

Claim 60 (Original) A system comprising the catheter device of Claim 57 further in combination with a therapeutic apparatus which is passable through said working lumen.

Claim 61 (Original) The system of Claim 60 wherein said therapeutic apparatus is selected from the group of therapeutic apparatus consisting of:

an angioplasty catheter;

an embolectomy catheter;

an occlusion member delivering catheter;

an embolization member delivering catheter;

an electro-cautery device; and,

a microcatheter.

Claim 62 (Original) A system comprising the catheter device of Claim 57 further in combination with a diagnostic device which is passable through said working lumen.

Claim 63 (Original) The system of Claim 62 wherein said diagnostic device is selected from the group consisting of:

an angiographic catheter;

a sensor.

Claim 64 (Currently Amended) A catheter device which is insertable into an anatomical structure of a mammalian patient through which body fluid may flow to a target region of the patient, said catheter device being operative to effect in situ heat exchange with the body fluid to effect temperature alteration of the target region, said catheter device comprising:

an elongate flexible catheter having a proximal end and a distal end, the entire length of said flexible catheter being defined as the distance from its proximal end to its distal end; at least one fluid lumen in through which said thermal exchange fluid may be circulated;

a heat exchanger located at a first location on the catheter, said heat exchanger comprising at least one generally helical flow path through which a heat exchange fluid may circulate; said heat exchanger being operative to exchange heat between body fluid in heat exchange proximity to said heat exchanger and heat exchange fluid circulating through said heat exchanger, said first location extending less than the entire length of the catheter;

a body-fluid channeling sleeve formed about a segment of said catheter including the first location at which at least a portion of said heat exchanger is located, said body fluid channeling sleeve defining a body fluid flow space between said body fluid channeling sleeve and said catheter, said body fluid channeling sleeve having a body fluid inlet located proximal to the heat exchanger and a body fluid outlet located distal to at least a portion of said heat exchanger, such that body fluid will enter the flow space through said body fluid inlet, will then flow through said flow space in heat exchange proximity to at least a portion of said heat exchanger, and then out of said body fluid outlet and to a conduit in fluid communication with said target region of the patient's body.

Claim 65 (Original) The catheter device of Claim 64 for controlling the temperature of a target region of the patient's body to which a body fluid is flowing through a first anatomical conduit of a first diameter, and wherein said first anatomical conduit is connected to and in fluid communication with a second anatomical conduit of a second diameter larger than said first diameter, wherein said body-fluid channeling sleeve has a distal portion and a proximal portion, said body fluid outlet located on said distal portion and said body fluid inlet located on said proximal portion, said distal portion is sized to be advanced into said first anatomical conduit while said proximal portion remains positioned within the second anatomical conduit, such that body fluid from said second anatomical conduit will enter the flow space through said body fluid inlet, will then flow through said flow space in heat exchange proximity to said heat exchanger, and then out of said body fluid outlet into said first conduit and thus to said target region of the patient's body.

Claim 66 (Original) A catheter device as in Claim 65 wherein the cross-sectional diameter of said distal portion of the blood channeling sleeve is smaller than the cross-sectional diameter of said proximal portion of the blood channeling sleeve.

Claim 67 (Original) A catheter device as in Claim 65 wherein said distal portion has a shoulder formed thereon, said shoulder sized and configured to fit snugly within said anatomical conduit such that substantially all flow of said body fluid from said second anatomical conduit to said first anatomical conduit flows through said body fluid channeling sleeve.

Claim 68 (Original) The catheter device of Claim 64 wherein the heat exchanger comprises:

at least one balloon through which said thermal exchange fluid is circulated, and said heat exchange fins comprise a plurality of lobes.

Claim 69 (Original) The catheter device of Claim 64 wherein said at least one heat exchange fin comprises at least one outwardly extending longitudinal fin.

Claim 70 (Original) The catheter device of Claim 64 wherein said at least one heat exchange fin comprises at least one outwardly extending annular fin.

Claim 71 (Original) The catheter device of Claim 64 wherein said at least one heat exchange fin comprises at least one outwardly extending helical fin.

Claim 72 (Original) The catheter device of Claim 64 wherein said at least one heat exchange fin comprises a plurality of outwardly extending protuberances.

Claim 73 (Original) The catheter device of Claim 64, said catheter further comprising an insertion portion, said insertion portion for insertion into the patient, said insertion portion extending from the distal end to a point short of the proximal end; and a working lumen, said working lumen extending through at least part of said insertion portion

Claim 74 (Original) A system comprising the catheter device of Claim 73 further in combination with:

a guide wire sized to be passable through said working lumen.

Claim 75 (Original) A system comprising the catheter device of Claim 73 further in combination with:

an apparatus for infusion of a medicament through said working lumen.

Claim 76 (Original) The system of Claim 75 wherein said apparatus for infusion contains a medicament selected from the group of medicaments consisting of:

a thrombolytic agent;
an anticoagulant;
a neuro-protectant;
a barbiturate;
an anti-seizure agent;
an oxygenated perfusate;
a vaso-dilator;
an agent which prevents vaso-spasm;
an agent to prevent platelet activation; and,
an agent to deter the adhesion of platelets.

Claim 77 (Original) A system comprising the catheter device of Claim 73 further in combination with:

a diagnostic probe which is passable through said working lumen.

Claim 78 (Original) A system as in Claim 77 wherein said diagnostic probe is selected from the group consisting of:

an angiographic catheter;
a temperature sensor;
a pressure sensor;
a blood gas sensor; and

an enzyme sensor.

Claim 79 (Original) A system comprising the catheter device of Claim 73 further in combination with:

an apparatus for infusion of a radiographic contrast agent through said working lumen;
and,

an imaging apparatus for imaging the radiographic contrast agent which has been infused through said working lumen.

Claim 80 (Original) A system comprising the catheter device of claim 73 further in combination with a therapeutic apparatus which is passable through said working lumen.

Claim 81 (Original) The system of Claim 80 wherein said therapeutic apparatus is selected from the group of therapeutic apparatus consisting of:

an angioplasty catheter;
an embolectomy catheter;
an occlusion member delivering catheter;
an embolization member delivering catheter;
an electro-cautery device; and,
a microcatheter

Claim 82 (Original) A catheter device as in Claim 64 wherein said body fluid inlet is provided with valves, said valves operable between an open condition and a closed condition, said open condition permitting flow of body fluid into said blood channeling sleeve through said body fluid inlet, said closed condition preventing the flow of body fluid out of said blood channeling sleeve through said body fluid inlet.

Claim 83 (Original) A catheter device as in Claim 64 wherein said catheter has a distal shaft portion, said distal shaft portion extending from within said blood channeling sleeve distal of said blood channeling sleeve, said distal shaft portion having a central lumen there through, said central lumen in fluid communication with said flow space at a first location and in fluid

communication with said conduit in communication with said target region at a second location.

Claim 84 (Original) A catheter device as in Claim 83 wherein said blood channeling sleeve is sealed around said distal shaft distal of said first location.

Claim 85 (Cancelled)

Claim 86 (Cancelled)

Claim 87 (Cancelled)

Claim 88 (Original) A system for controllably affecting the temperature of a patient, said system comprising:

a catheter device comprising an elongate flexible catheter having a proximal end and a distal end, the entire length of said flexible catheter being defined as the distance from its proximal end to its distal end, said flexible catheter having an insertion portion, ~~said insertion portion for insertion into an anatomical conduit of the patient, said insertion portion extending from the distal end to a point short of the proximal end,~~ a heat exchanger located at a first location on the insertion portion of the catheter, said heat exchanger comprising a generally helical balloon or a balloon having at least one generally helical lobe through which heat exchange fluid may circulate ~~having heat exchange fins extending from the surface of said heat exchanger, said heat exchange fins comprising increased surface area for enhanced heat exchange,~~ said heat exchanger being operative to exchange heat between body fluid flowing through the anatomical conduit in which the heat exchanger is positioned and in heat exchange proximity to said heat exchanger and heat exchange fluid circulating through said heat exchanger, said first location

Claim 89 (Original) A system as in Claim 88, further comprising a heating unit, said heating unit operative to exchange heat with said heat exchange fluid.

Claim 90 (Original) A system as in Claim 89 wherein said heating unit is a solid-state thermoelectric cooler.

Claim 91 (Original) A system as in Claim 89 wherein said target parameter is a temperature, and said sensor is a temperature sensor, said controller operable to activate said heating unit.

Claim 92 (Original) A system as in Claim 88 further comprising a plurality of sensors each generating a separate signal, said controller operable to control said catheter in response to a plurality of signals.

Claim 93 (Original) A System as in Claim 92, further comprising a plurality of catheter devices, said controller operable to control each of said catheter devices.

Claim 94 (Original) A system as in Claim 93 wherein at least one catheter device imparts heat to said body fluid at a first location, and at least one catheter device removes heat from said body fluid at a second location.